"A Study on the Strength of concrete with partial replacement of coarse aggregate by over burnt & recycle bricks"

Neha dixit [1] Dr.Sanjay Bhandari[2], Dr Ashit Kumar saxena[3], Subhash Maheshwari[4], Himanshu Dixit[5]

[1]Research scholar, Pursuing Master of Engineering (IV SEM), Environmental Engineering, Samrat Ashok Technological Institute, Vidisha.[2] Professor Department of Civil Engineering Samrat Ashok Technological Institute Vidisha. [3] Professor Department of Civil Engineering Samrat Ashok Technological Institute Vidisha [4]Pursuing Master of Engineering Environmental Engineering, Samrat Ashok Technological Institute, Vidisha,[5]Pursuing Master of Engineering Environmental Engineering, Samrat Ashok Technological Institute M.P

Abstract: In this paper, the mud block is pulverized into the sizes of coarse aggregate for concrete expecting to create basic lightweight concrete. On accomplishing the focused on concrete properties, the physical and mechanical properties of the acquired concrete are contemplated. The reuse of development and destruction squanders, particularly pulverized mud blocks, speaks to a noteworthy commitment to the earth. Because of the idea of mud blocks, it can be considered as wellspring of coarse aggregate to create auxiliary lightweight concrete. The concrete solid shapes, pillars and barrels of M30 review were tossed in this trial investigate work and attempted to dissect diverse properties of concrete like compressive quality, split flexibility, workability and flexural quality. Pounded mud blocks was utilized as a coarse aggregate with wire mesh on the dose of 15, 30, and 45% by weight of aggregate in concrete with the age of 7, and 28 days. In this work, the general properties of new and solidified concrete were attempted and the results were analyzed.

Keywords: concrete, over burnt bricks, coated recycled Aggregate, partial replacement coarse aggregate, waste materials, and crushing loads.

INTRODUCTION

Concrete is made by mixing cement, sand, coarse aggregate and water to conveyed material that can be framed into any shape. The critical volume concrete is stacked with aggregate. The thought of aggregate in concrete declines its drying shrinkage properties and upgrades various properties, for instance, compressive quality, etc. Regardless, it is excessive to ship, so neighborhood sources are relied upon to diminish the expense of vehicle, yet as a result of land prerequisites this isn't available at all spots, as such it requires discovering various sources and choice from close-by sources.

The various materials are used as an alternative hotspot for regular coarse aggregate, for instance, reused low quality crushed block, reused coarse aggregate, coconut shell, reused plastic aggregate, very much expended block, etc. For this work select a jhama class block as an alternative hotspot for course aggregate.

This material was singled out the grounds that in block making, an expansive number of blocks are dismissed due to non congruity is the bowed kind of block made because of high temperature control in the radiator. These rejected blocks can in addition be potential wellspring of coarse aggregate. As per general definition concrete is a composite material so by abusing the condition for the comprehensive network, this paper demonstrates the examination that is done on the concrete when trademark coarse aggregate isn't totally superseded by Jhama Class block aggregate.

Aggregates are the essential constituents in the concrete composite that help with lessening shrinkage and enable economy to concrete creation. A broad section of the aggregates utilized are conventionally happening aggregates, for example, squash shake, shake and sand which are generally misleadingly natural or inactive when reinforced together with concrete.

Recovery of brick units from masonry built with portland cement mortar is impractical for re-use since the bonding is too strong. Therefore, they are mostly crushed and used with the mortar impurity. A selective screening to obtain ceramic material is also possible. Obviously waste material from the manufacturing plants does not have this problem.

Today recycled brick is used as overlay material in tennis courts and tracking fields and as plant substrate. In civil engineering applications, it can be used in unbound systems such as drainage blankets, sub base in road construction, or fill material in embankments. On the other hand, high-grade utilization, such as an ingredient in concrete or asphalt, is also possible. Crushed brick aggregate in portland cement concrete is known to be used in Germany in 1860. Systematic investigations on the use of crushed brick aggregate dates back to 1928. However, the first significant practical application was after the Second World War in Germany where the cities were destroyed down to rubble. Approximately 11.5 million cubic meters of crushed brick aggregate were used to build 175,000 dwellings.

Material & Tests

A.GENERAL:- In this examination an endeavor has been made to think about the impact of recycle brick & non coated over burnt bricks with wire mesh on properties of concrete. The methodology took after, tests directed for determination of configuration blend is examined in this part.

1) Specific gravity Test:

- Specific gravity Test for cement
- Specific gravity Test for fine aggregates
- Specific gravity Test for coarse aggregates

2) Water absorption Test

- Water absorption Test for fine aggregates
    - Test for coarse aggregates
    - Sieve analysis
    - Surface moisture Test
    - Bulk density Test
    - Water adsorption
    - Fineness of cement Test .

MATERIAL USED:-

A) Materials:-

a) Cement:

Cement is a fine, grey powder. It is mixed with water and materials such as sand, gravel, and crushed stone to make concrete. The cement and water form a paste that binds the other materials together as the concrete hardens. Ordinary Portland cement having 28 days compressive strength of 46 MPa (ASTM 1994) was used for preparation of all concrete cubes. By using one type of cement, the effect of varying the types of coarse aggregate in concrete is investigated.

TABLE:-I Properties of cement

S. No.	**Characteristics**	**Values obtained**	**Standard values**
1	Normal consistency	35%	
2	Initial Setting Time	45 min	Not less than 30 min.
3	Final Setting Time	486 min.	Not Greater than 600 min.
4	Sp.Gr.	3.12	
5	Fineness	4.8	

b) Fine Aggregate*:*

The sand used for the experimental programmed was locally procured and conformed to Indian Standard Specifications IS: 383-1970. The sand was first sieved through 4.75 mm sieve to remove any particles greater than 4.75 mm and then was washed to remove the dust.

c) Coarse Aggregate*:*

The broken stone is generally used as a coarse aggregate. The nature of work decides the maximum size of the coarse aggregate. Locally available coarse aggregate having the maximum size of 20 mm was used in our work. The aggregates were washed to remove dust and dirt and were dried to surface dry condition. The aggregates were tested as per Indian Standard Specifications IS: 383-1970.

d) Bricks

Only one type of unused clay bricks of 240x115x70 mm working sizes was used in the investigation before the bricks were crushed down into a coarse aggregate, their uniaxial compressive strength was recorded for comparison with the aggregate produced by crushing them down to coarse aggregate. The compressive strength of the whole brick is found to be 12.75 MPa.

e) Recycle brick

The word „brick" refers to ceramic masonry unit which is manufactured by firing clayey soil. Recycled clay brick" is defined as the waste material that can be obtained from demolished masonry or non-standard discarded products at the end of the manufacturing process.

Sources of Recycled Brick

There are two major sources from which recycled clay brick can be obtained construction and demolition waste, and clay brick/tile manufacturing plants. Construction and demolition waste (CDW) includes the unwanted leftover material from any construction activity which can be new construction, renovation or demolition.

RESULT AND DISSCUSSION

CONSISTENCY OF CEMENT TEST

The Normal Consistency of Cement is portrayed as that level of water required to convey a bond paste of standard consistency. For affirmation reason, run of the mill consistency is taken as the water content at which vicat's plunger penetrates up to a condition of 5 to 7 mm from the base of the vicat's frame. When we add water to the bond, the paste starts solidifying and gets quality. The fundamental point is to find the water content required to make a security paste of standard consistency as demonstrated by the May be: 4031 (Part 4) – 1988. The control stick had normal consistency of 36%.

WORKABILITY OF CONCRETE

A slump test can be utilized to quantify the workability of concrete. Each bunch of concrete should be tried for consistency instantly subsequent to blending, by one of the techniques depicted in IS: 1199-1959.

S.No.	Percentage of Variation	Slump in (mm) over burnt bricks	Slump in (mm) recycle bricks
1	0	76	76
2	15	85	85
3	30	130	93
4	45	150	105

Compressive Strength of Concrete Cube Sample

In spite of the fact that the pressure test on concrete is easy to do, the test outcome is trying to reason as far as genuine quality which is impact by many components. Huge numbers of the imperative properties of concrete like the modulus of flexibility, protection from shrinkage, and crawl and sturdiness enhance with the expansion in compressive quality.

Compressive Strength of Concrete M-30 Grade on recycles bricks

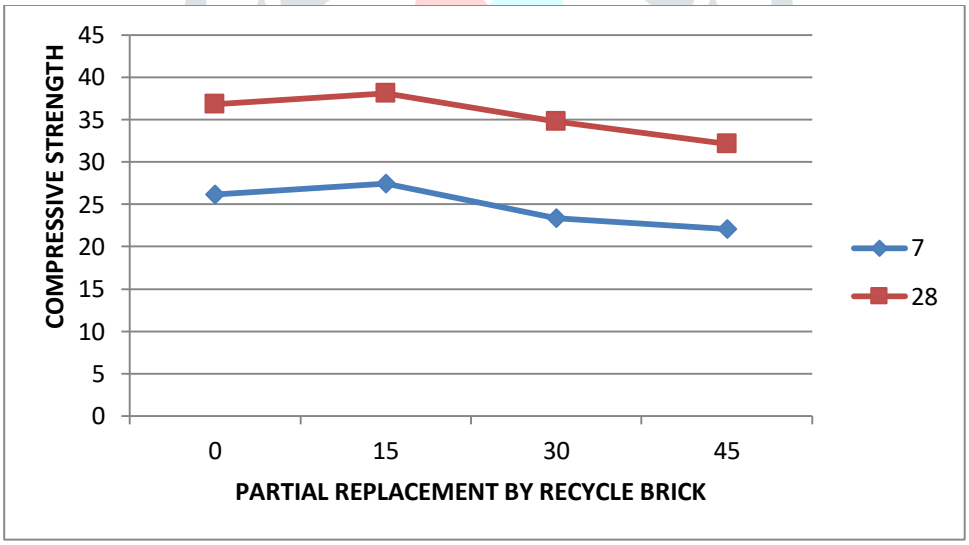

Fig. 4.1 Compressive Strength Reading for M-30 Grade having Normal Composition with recycle bricks different Composition

Compressive Strength of Concrete M-30 Grade on over burnt bricks

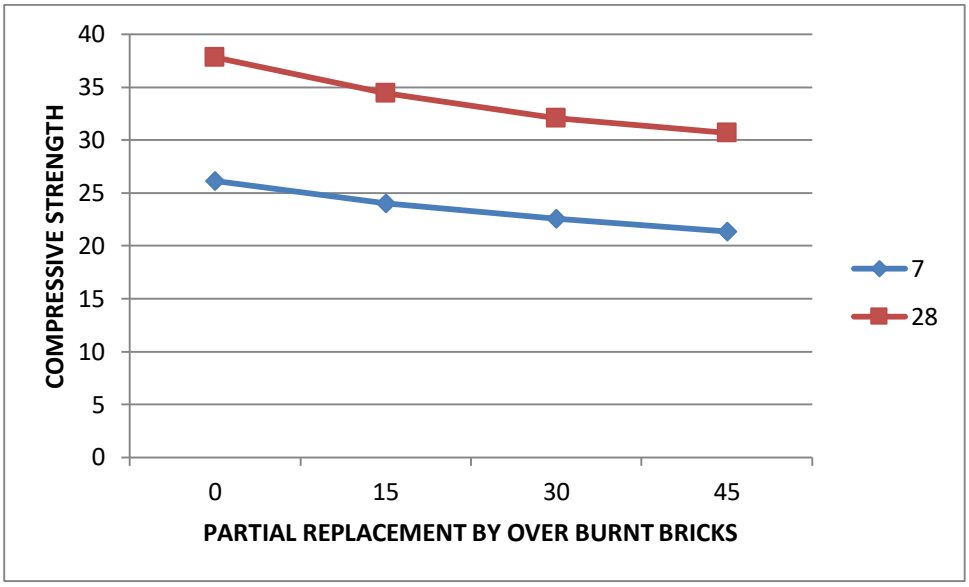

Fig. 4.2 Compressive Strength Reading for M-30 Grade having Normal Composition on over burnt bricks different Composition

Tensile Strength of Concrete Cylinder

The split tensile strength of concrete material is attempted by making barrel of size 150mm x 300 mm and is reliably cured for 28 days testing. Totally 24 chambers were threw for standard M35, grade and for 15%, 30% and 45% by weight fractional replacement of recycle aggregate & non coated over burnt bricks aggregate for coarse aggregate.. Three illustrations are attempted and the ordinary regards are taken as tensile strength of concrete. The estimations of split tensile strengths are showed up in table.

Tensile Strength of Concrete Cylinder with M-30 Grade

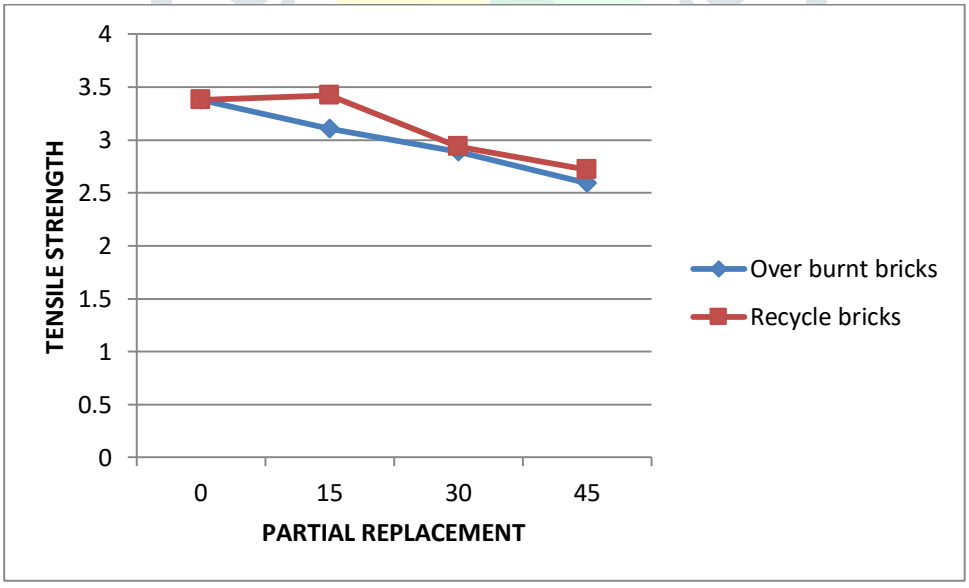

Fig.4.3 Tensile Strength Results of M-30 Grade having Different Composition of over burnt / recycle bricks

Flexural Strength of Concrete

Flexural power additionally called as modulus of break. In this test works absolutely 24-beams of size 700 x 100 x 100 are casted of M30, grade and for 15%, 30% and 45% by weight fractional replacement of recycle aggregate & non coated over burnt bricks

aggregate for coarse aggregate. At that point analyze the estimations of both plan blends. The flexural estimations of various blends are shown

4.5.1 Flexural Strength Test with M-30 Grade

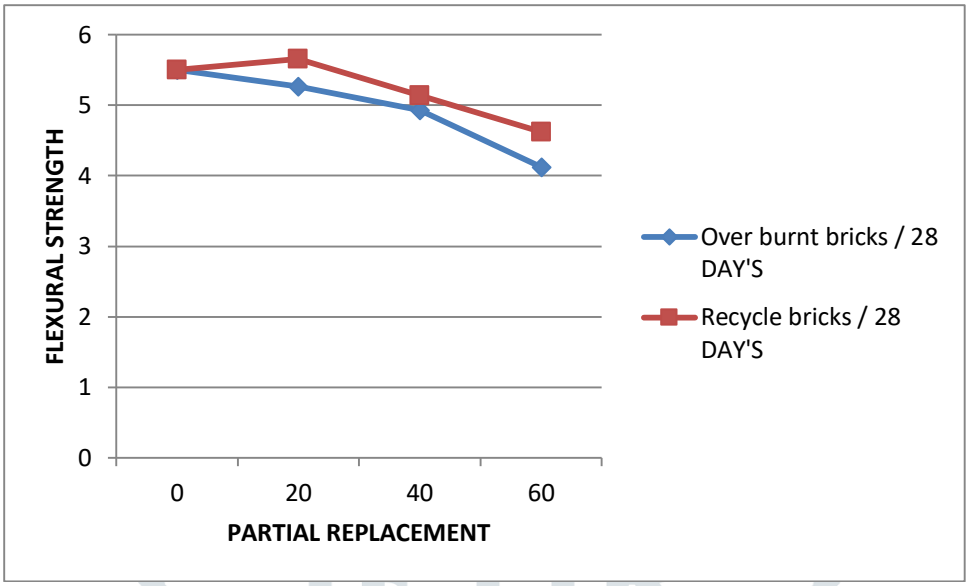

Fig.4.4 Flexure Strength results of M-30 Grade having Different Composition of over burnt / recycle brick

CONCLUSION

Following are the salient conclusions of the study:-

In this exploratory examination we have utilized over consumed/reuse blocks as fragmented substitution (15, 30 and 45%) of coarse aggregate an alternative material of concrete for M30 audit of concrete and from various tests on new and cemented concrete we have shut after results.

The Normal Consistency of Cement is portrayed as that level of water required to convey a cement paste of standard consistency. For affirmation reason, run of the mill consistency is taken as the water content at which vicat's plunger penetrates up to a condition of 5 to 7 mm from the base of the vicat's frame. When we add water to the cement, the paste starts solidifying and gets quality. The fundamental point is to find the water content required to make a security paste of standard consistency as demonstrated by the May be: 4031 (Part 4) – 1988. The control stick had normal consistency of 36%.

1. Slump exhibits that the workability increases with the extension in the rates of 15, 30, and 45% of over expended squares/reuse obstructs with the M-30 audit of concrete.

2. It can be seen from Figure that Compressive Strength result at 7, and28 days are higher than with the usage as partial replacement 15%, and after that increase dosage of recycle brick aggregate than strength has low with 30 and 45% of recycle bricks by coarse aggregate with the M-30 grade of concrete. we should comparison out to 15, 30 and 45 % partial replacement, to be figure out that 15% partial replacement has higher to compare to 30 and 45% of partial replacement of coarse aggregate in concrete specimen.

3. It can be seen from Figure that Compressive Strength result at 7, and 28days are lower than with the usage as partial replacement of over burnt bricks by coarse aggregate with the level of 15, 30, and 45% usage with M-30 grade of concrete.

we should comparison out to 15, 30 and 45 % partial replacement, to be figure out that 15% partial replacement has higher to compare to 30 and 45% of partial replacement of coarse aggregate in concrete specimen

4. We can watched that Tensile Strength has increase with 15% (Recycle brick aggregate) and increase dose of 30% and 45% strength has lower then utilized as fragmentary substitution of coarse aggregate by reuse/over consumed blocks, with the comparison on 15% higher than level of 30 to 45%, lower than show up particularly regarding the age of 28 days.
5. We can watched that flexural strength has lower than with the utilized as partial replacement of coarse aggregate by over burnt / recycle bricks, when increases dosage of over burnt / recycle bricks 15 to 45%, appear differently in relation to other creation beam cases with the age of 28 days.

REFRENCES

1. Apebo N. S., Agunwamba J. C., Ezeokonkwo,J. C" The suitability of crushed over burnt bricks as coarse aggregates for concrete" International Journal of Engineering Science and Innovative Technology (IJESIT) Volume 3, Issue 1, January 2014.
2. Tanvir Hossain, Md. Abdus Salam, Mohiuddin Abdul Kader, Pervious concrete using brick chips as coarse aggregate: An experimental study, Journal of Civil Engineering (IEB), 40 (2) (2012) 125-137,2011.
3. Kasi Rekha, M. Potharaju," Residual Compressive Strength of Recycled Brick Aggregate Concrete at High Temperatures" International Journal of Emerging Technology and Advanced Engineering, Volume 5, Issue 1, January 2015.
4. Rashid, M. A., Hossain,T. and Islam M. A." Properties of higher strength concrete made with crushed brick as coarse aggregate" Journal of Civil Engineering (IEB), 37(1), pp-43 52, 2009.
5. Bhattacharjee, E., Nag, D., Sarkar, P. P. and Haldar,L," An Experimental Investigation of Properties of Crushed over Burnt Brick Aggregate Concrete" International Journal of Engineering Research and Technology, Volume 4, Number 1, 2011, pp. 21-30.
6. George Rowland Otoko, "Use of crushed clay bricks as aggregate in concrete", International Journal of Engineering and Technology Research Vol. 2, No. 4, pp. 1 - 9, April 2014.
7. Jafar Bolouri Bazaz, Mahmood Khayati, Navid Akrami, Performance of concrete produced with crushed bricks as the coarse and fine aggregate, IAEG Paper number 616 2006.
8. Gopinandan Dey and Joyanta Pal, Use of Brick Aggregate in Standard Concrete and Its Performance in Elevated Temperature, IACSIT International Journal of Engineering and Technology, Vol. 5, No. 4, August 2013.
9. Tariq Ali, Nouman Iqbal, Md Zeeshan, Md Zulfiqar Ali Khan, Evaluation of the Compressive strength of Concrete for partial replacement of Over Burnt Brick Ballast Aggregate, International Journal of Science and Modern Engineering (IJISME) December 2013.
10. Mohammad Abdur Rashid, Md. Abdus Salam, Sukanta Kumar Shill ,Md. Kowsur Hasan, Effect of Replacing Natural Coarse Aggregate by Brick Aggregate on the Properties of Concrete, DUET Journal Vol. 1, Issue 3, June 2012.
11. Fadia S. Kallak, Use Of Crushed Bricks As Coarse Aggregate In Concrete, Tikrit Journal of Eng. Sciences,Vol.16,No.3, September 2009.
12. Ksenija Janković, Dragan Bojović, Dragan Nikolić, Ljiljana Lončar, Zoran Romakov, frost resistance of concrete with crushed brick As aggregate, Architecture and Civil Engineering Vol. 8, No 2, pp. 155 – 162 2010.
13. Sathish Kumar R., "Experimental study on the properties of concrete made with alternate construction materials", International Journal of Modern Engineering Research, Vol. 2, Issue. 5, pp-3006-3012 Sept.-Oct. 2012.
14. Bureau of Indian Standards: IS- 10262-1982, "Indian Standard Recommended Guidelines for concrete mix design", 1982.

15. Bureau of Indian Standards: IS- 1489 (Part 1): 1991, "Indian Standard Portland-pozzolana cement specification", Part 1 fly ash based (Third revision), 1991.
16. Bureau of Indian Standards: IS- 2386-1963 (Part-I), "Indian Standard methods of test for aggregates for concrete", 1963.
17. Bureau of Indian Standards: IS- 2386-1963 (Part-IV), "Indian Standard methods of test for aggregates for concrete", Part-IV Mechanical properties, 1963.
18. Bureau of Indian Standards: IS- 383-1970, "Indian Standard Specification for coarse and fine aggregates from natural sources for concrete (second revision)", 1970.
19. Bureau of Indian Standards: IS- 456-2000, "Indian Standard Plain and reinforced concrete code of practice (fourth revision)", 2000.
20. Bureau of Indian Standards: IS- 516: 1959, "Methods of Test for Strength of Concrete," New Delhi, 2003.
21. Bureau of Indian Standards: IS- 5515:1983 Specification for compaction factor apparatus, 1983.
22. Bureau of Indian Standards: IS- 9103-1999, "Specification for concrete admixture", 1999.
23. Punamia B.C., "R.C.C. Designs", Laxmi publications (P) Ltd, New Delhi, pp. 09- 16. 2006.